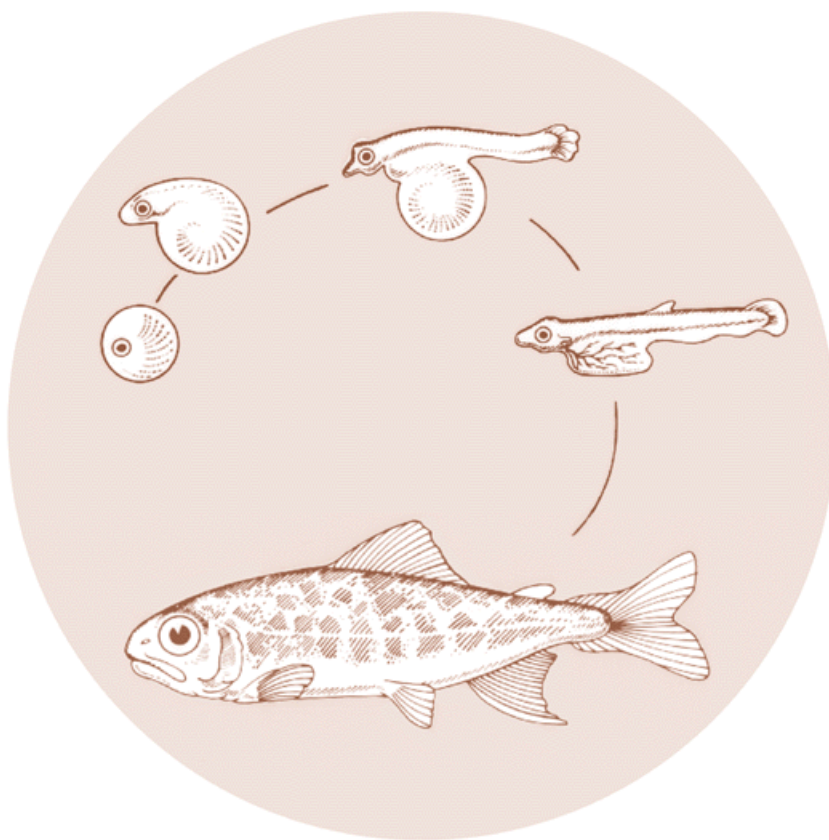


# AUGMENTED FISH HEALTH MONITORING IN IDAHO

Annual Report 1989 - 1990



DOE/BP-65903-3



This report was funded by the Bonneville Power Administration (BPA), U.S. Department of Energy, as part of BPA's program to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities on the Columbia River and its tributaries. The views of this report are the author's and do not necessarily represent the views of BPA.

This document should be cited as follows:

*A. K. Hauck, Eagle Fish Health Laboratory, Augmented Fish Health Monitoring in Idaho, Annual Report 1989 - 1990 to Bonneville Power Administration, Portland, OR, Contract DE-AI79-87BP65903, Project 87-117, 58 electronic pages (BPA Report DOE/BP-65903-3)*

This report and other BPA Fish and Wildlife Publications are available on the Internet at:

**<http://www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi>**

For other information on electronic documents or other printed media, contact or write to:

Bonneville Power Administration  
Environment, Fish and Wildlife Division  
P.O. Box 3621  
905 N.E. 11th Avenue  
Portland, OR 97208-3621

Please include title, author, and DOE/BP number in the request.

# AUGMENTED FISH HEALTH MONITORING IN IDAHO

Annual Report 1989 - 1990

Prepared by:

A. K. Hauck

Eagle Fish Health Laboratory  
Idaho Department of Fish and Game

Prepared for:

U.S. Department of Energy  
Bonneville Power Administration  
Environment, Fish and Wildlife  
PO Box 3621  
Portland, Oregon 97208

Project No. 87-117  
Contract No. DE-AI79-87BP65903

## Table of Contents

	Page
Acknowledgments.....vi	i
Abstract .....	ix
Introduction .....	1
Material and Discussion .....	5
Conclusions .....	13
Literature Cited .....	13
Appendix 1      Summary of project objectives .....	A1
Appendix 2      Technology transfer .....	B1

List of Tables

	Page
Figure 1	Map of Idaho fish propagation facilities ..... 4
Table 1	Anadromous facilities involved in project ..... 3
Tables 2a-p	Fish condition summaries ..... 14
Table 3	Adult inspection findings ..... 30
Table 4	Juvenile monitoring and diagnostic findings .... 33
Table 5a-f	Hatchery water supply data ..... 44

## ACKNOWLEDGMENTS

Many individuals have been involved to make this project successful. Ron Morinaka (BPA) should receive thanks for his support and patience. There are others playing less visible roles in the Bonneville Power Administration, whose efforts are nonetheless appreciated. The hatchery managers and their excellent supporting staff are also acknowledged for providing records and computer work in Table 5 and other support work unaccounted for here.

Bill Hutchinson and Tom Rogers are thanked for their encouragement and support. Field work reported from May 1989 through September 1989 was accomplished by Scott Foott. Laboratory work was accomplished by Roberta Bergstrom, Sharon Landin and Sharon Wavra. Keith Johnson lessened the work load by assisting with monthly and prerelease inspections. Roberta Bergstrom and Rosanne Lokker assisted with prerelease inspections and organosomatic data collections. Sharon Wavra prepared organosomatic calculations and transferred them and field data to the presented format. Rosanne Lokker's fine efforts reduced my scratchings to a legible manuscript.

## ABSTRACT

The Idaho augmented fish health monitoring contract DE-A179-87BP65903 was awarded in June 1987 and fully implemented in January 1988. The third annual report of activities serviced under this contract is presented. The prevailing fish health problems in 1989 include persistent infections caused by infectious pancreatic necrosis virus (IPNV), by Myxobolus (Myxosoma) cerebralis, Renibacterium salmoninarum and drug resistant Aeromonas salmonicida at select hatcheries on Idaho's upper Columbia River tributaries. Administrative focus during **the** year was to fill vacant positions and still maintain the monitoring effort at levels agreed on under contract. Complete diagnostic and inspection services were provided to eleven Idaho anadromous facilities. The present report describes work done to **meet** contract agreements and summarizes the fish health findings of anadromous stocks reared at and returning to Idaho's facilities during 1989.

FISH HEALTH MONITORING  
Project 87-117  
May 9, 1990

INTRODUCTION

Since 1987 Idaho Department of Fish and Game (IDFG), referred to herein as the Department, has participated in a Columbia basin augmented fish health monitoring project funded by Bonneville Power Administration (BPA). The project was designed to upgrade and standardize fish health monitoring procedures used by anadromous fish producers in the Columbia Basin. The purpose of the project is to collect fish health information, evaluate it, and determine if fish health can effectively be used in mitigation programs.

The Department operates eleven fish production facilities in the Columbia basin (Table 1, Figure 1). Fish health services for these facilities were provided by the Eagle Fish Health Laboratory located at Eagle, Idaho.

This report constitutes the results and progress for the period May 1989 to April 1990 or months 24-35 of the 60 month project. See Foott and Hauck (1988, 1989) for previously reported information.



## MATERIALS AND METHODS

Complete diagnostic, monitoring, noninfectious, and water quality services are conducted at the Eagle Fish Health Laboratory. The laboratory provides bacterial, parasitic, viral, histopathological, and water quality support services.

Monitoring methods for infectious diseases have not changed appreciably from those reported previously (Foott and Hauck, 1988, 1989). Fish health condition was assessed according to Goede (1988). Sampling and laboratory methods have been according to Amos (1985) and terms and conditions required by contract or interagency steering committee. Methods outlined by the Pacific Northwest Fish Health Protection Committee Model Comprehensive Fish Health Program were also considered and used as appropriate. Each monitoring or inspection case and sample collected on a given date is referred to herein as an "accession". The first numbers of each accession refer to the year of collection; the last number is the case number of the corresponding year.

A data storage and retrieval system has been developed using template DBase 3+ written with Clipper software program. This **system** is being used at the laboratory. It is also being modified to other Department programs now in use or under preparation.

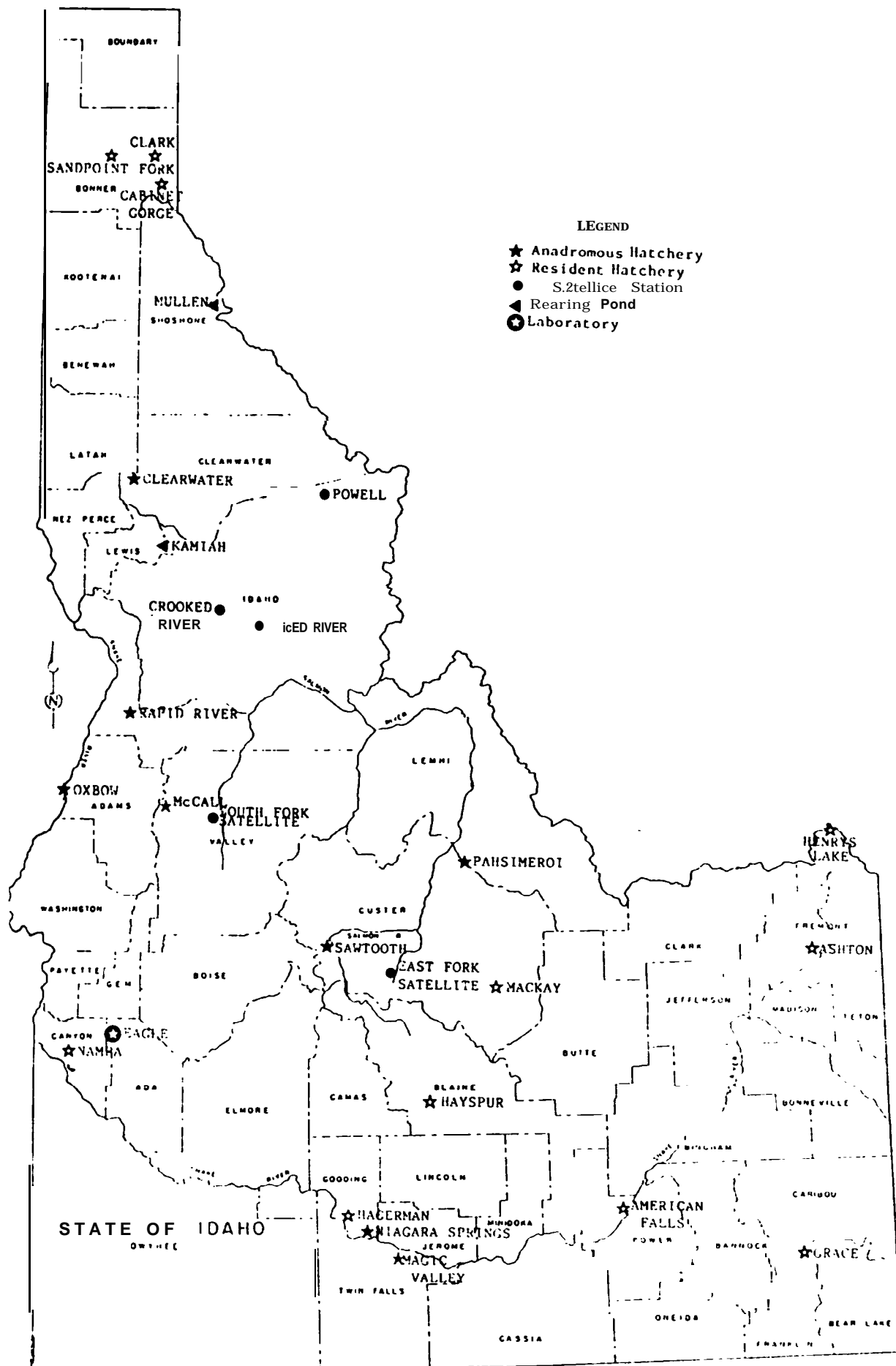
Table 1. List of upper Columbia River Basin anadromous facilities operated by Idaho Department of Fish and Game.

Facility	Water Source	Stock/species
Magic Valley Hatchery Bud Ainsworth, Manager Filer, Idaho	covered spring above Snake River	Pahsimeroi A steelhead, East Fork B steelhead, Clearwater B steelhead
McCall Fish Hatchery and South Fork Satellite Gene McPherson, Manager McCall, Idaho	Payette Lake	South Fork Salmon River, summer chinook
Niagara Springs Hatchery Jerry Mowery, Manager Wendell, Idaho	uncovered spring above Snake River	Pahsimeroi and Hells Canyon A steelhead
Oxbow Hatchery Doug Young, Manager Oxbow, Oregon	SNAKE RIVER	Hells Canyon A steelhead (adult holding/ incubation)
Pahsimeroi Hatchery Bob Moore, Manager Ellis, Idaho	Pahsimeroi River	Pahsimeroi summer chinook, A steelhead
Rapid River Hatchery Tom Levendofsky, Manager Riggins, Idaho	Rapid River	Rapid River and Hells Canyon spring chinook
Powell Satellite*+ Jerry McGehee, Manager Kamiah, Idaho	Lochsa River	Clearwater spring chinook
Red River Satellite*+ Jerry McGehee, Manager Kamiah, Idaho	South Fork Clearwater River	Clearwater spring chinook
Sawtooth Hatchery and East Fork Satellite Richard Alsager, Manager Stanley, Idaho	Salmon River	East Fork and Salmon River spring chinook

\* Adult holding and juvenile release site for Clearwater Hatchery (under construction)

+ Not listed in BPA contract as part of augmented fish health monitoring project.

Figure 1. Location of Idaho Fish and Game fish propagation facilities.



## RESULTS AND DISCUSSION

### Project Staff and Equipment

In September, 1989, work on the project was interrupted by the resignation of the lead pathologist, Scott Foott, who accepted employment with the U.S. Fish and Wildlife Service. After the department announced the position twice, Doug Munson was hired to fill the position in June 1990.

Continuation of contract terms and conditions has been accomplished by field work conducted by A. K. Hauck and Keith A. Johnson. Laboratory staff who have assisted with field work include Roberta Bergstrom and Rosanne Lokker. Laboratory analyses have been conducted by Sharon Wavra, Roberta Bergstrom, Sharon Landin and quality controlled by A. K. Hauck and Keith A. Johnson.

Purchase of approved equipment has occurred according to contract or as approved by BPA. In some cases equipment has not been installed because of insufficient laboratory space. This deficiency will be remedied as the new Eagle Fish Health Laboratory is completed early in 1991.

### Project Technical Steering Committee

Activities are according to contract terms and conditions. For more detail, refer to Appendix 1.

### Fish Condition (Organosomatic Index Work)

Contract terms specify conduct of organosomatic analyses, at index hatcheries as follows:

<u>Facility</u>	<u>Species</u>
McCall	Summer chinook
Sawtooth	Spring chinook
Rapid River	Spring chinook

Both the above and additional analyses were conducted. The additional tests included Pahsimeroi steelhead (A), Niagara Springs steelhead (A), Magic Valley steelhead (A & B). Data are summarized in Tables 2a - 2p.

Comparison of data on steelhead provided interesting results. Lengths, weights, hematocrits, and serum protein values for Magic Valley were on the average lower than those for Niagara Springs steelhead, even though Magic Valley fish were sampled a few days later. Hematocrits for fish from both hatcheries were within normal limits. In comparing steelhead tissue conditions at the two facilities, Magic Valley again averaged lower in the categories of normal eyes, gills, and thymus. Niagara Springs averaged lower in pseudobranch and spleen conditions. There was no difference between conditions of hind guts, kidneys or livers at the two facilities. It is interesting to note that Magic Valley steelhead experienced subclinical infections of IPN virus. These infections were first detected in cell culture in October 1989. They persisted in all Magic Valley stocks until release. The coefficients of variation for hematocrit (Pahsimeroi stock) and serum proteins (both Pahsimeroi and East Fork stocks) indicated the presence of an infectious agent (Goede, 1987). Coefficients of variation for Niagara Springs stocks were within normal limits. These stocks did not experience the long term, chronic infectious disease problem seen at Magic Valley. IPN virus was detected once during the year at Niagara Springs near release time, and Aeromonas salmonicida was detected twice early in 1990. Both A.salmonicida infections were effectively treated with Romet 30.

Evaluation of condition of chinook stocks via the organosomatic autopsy method revealed less interesting results. Coefficients of variation were with one exception within normal limits for Rapid River, McCall, and Pahsimeroi chinook salmon stocks. The single exception was with hematocrits of pond 2A chinook at Rapid River. Leucocrits in most samples were very low or not detectable. However, substantial (approximately 1mm) leucocrits were present in most Rapid River juvenile spring chinook examined. EIBS virus was detected in low levels in both ponds at Rapid River through most of the year and may have been the infectious process accounting for the high hematocrit coefficient of variation and leucocrits. It is noteworthy, however, that EIBS was not detected in blood from fish with high hematocrit coefficient of variation, but was detected in pond 1 fish which had a normal coefficient of variation. Comparing summarized information of normal tissues between facilities showed that Rapid River and McCall had lower gill and liver conditions than Pahsimeroi. Pahsimeroi had lower pseudobranch conditions than Rapid River and McCall. These, however, may reflect viewpoints of the two observers performing the analyses.

Sawtooth and East Fork chinook both had lower liver conditions than Pahsimeroi. Pahsimeroi had lower gill, pseudobranch, and spleen conditions than either Sawtooth or East Fork chinook smolt. The only significant infectious agents present in these stocks were Myxobolus cerebralis (heavy at Pahsimeroi and light at Sawtooth) and Renibacterium salmoninarum (moderate infections) at Sawtooth.

## Augmented Fish Health and Pathogen Monitoring

The augmented fish health and pathogen monitoring work is discussed in the following categories: viral pathogens, bacterial pathogens, parasitic pathogens, other fish losses, summary of lab support services, and hatchery water supply studies.

### VIRAL PATHOGENS

Infectious hematopoietic necrosis virus (IHNV), the causative agent of IHN disease, was detected in 1988 brood year Pahsimeroi A steelhead at Magic Valley (accession 89-42). This case represented a carrier, marginally clinical condition as the highest daily mortality in a four day period was 0.06%. Also, external signs were not evident and intestinal hemorrhage was present in one of ten moribund fish. McCall brood South Fork Salmon River summer chinook also had IHNV in 1/9 fish tissues (kidney, spleen, pyloric caeca) following blind passage. The virus was not detected in samples of offspring from these brood at McCall hatchery. IHNV was not detected in either brood fish or juvenile anadromous salmonids at Niagara Springs, Pahsimeroi, Rapid River, or Sawtooth hatcheries or Red River pond during the report period.

Infectious pancreatic necrosis virus (IPNV), the causative agent of IPN virus disease, was detected in fish from Magic Valley, Niagara Springs, and East Fork satellite hatcheries. The Niagara Springs incident (accession 90-45) occurred in 89 brood Pahsimeroi A steelhead in late February. Clinical disease was not present. The virus was detected in pooled fish following blind passage. The isolation at East Fork occurred in April 1989 in brood **East Fork B** steelhead (accession 89-67). The virus was later detected in progeny from fish of this brood year reared at Magic Valley. IPNV was detected in Magic Valley steelhead from October to April inclusive, prior to release in the Salmon River. It was present in both normal as well as moribund fish. Mortalities during the October to April period were low and are tabulated as follows:

Monthly and Daily Mortalities (5)

Month	89 East Fork		89 Dworshak		89 Pahsimeroi	
	Monthly	Daily	Monthly	Daily	Monthly	Daily
October	0.20	0.007	0.4	0.013	0.2	0.007
	(IPN not isolated)					
November	0.26	0.009	0.3	0.011	0.3	0.011
December	0.23	0.008	0.4	0.013	0.06	0.002
January	0.13	0.004	0.1	0.003	0.07	0.002
February	0.05	0.002	0.1	0.003	0.04	0.001
March	0.04	0.001	0.06	0.002	0.03	0.001
April	0.01	0.0005	0.02	0.001	0.01	0.0003
Average	0.13	0.004	0.20	0.007	0.10	0.003

Hatchery sanitation measures have been recommended at Magic Valley to break the infection cycle.

Erythrocytic inclusion body syndrome virus (EIBS). Inclusion bodies typical of morphology and staining character of ELBS were reported only in Rapid River spring chinook. The prevalence averaged 30.3% from October to March and was primarily noted in pond 1. No losses were directly attributed to EIBS.

#### BACTERIAL PATHOGENS

The bacterial kidney disease (BKD) agent (Renibacterium salmoninarum) was detected in McCall summer chinook (adults: 11.1%; juveniles 50% in September, 0% thereafter). at Niagara Springs (89 Pahsimeroi A steelhead, 3.3% only in March), in brood Pahsimeroi summer chinook (66.7%), in Rapid River spring chinook (adults: 30.0%; juveniles 100% in October, 1.7% in December, and 0% thereafter), in Red River adult Dworshak spring chinook, in Sawtooth spring chinook (adult: 3.0% in August; juveniles 41.7% in July, 56.3% in August, 6.3% in September, 4.8% in December, 9.8% in February, 50% in April). BKD was attributed as the cause of mortality at Sawtooth in February in Sawtooth chinook (100% prevalence and mortality of 0.68%). At East Fork the BKD agent was detected in B steelhead in April (3.3%), in spring chinook (adults in August: 40%, juveniles in March (33.3%). Twice (during spring and fall) Gallimycin was fed at McCall, Pahsimeroi, and Rapid River (4.5g/100lb of fish/day for 14 plus days). At Sawtooth Gallimycin was fed only once (during the spring). These treatments are considered the reason for the declining prevalence in BKD at Pahsimeroi, Rapid River and McCall. The one treatment at Sawtooth may account for the relatively higher levels of BKD there compared to the other facilities. An interesting side effect following the second

Gallimycin treatment was the appearance of tetany in chinook following handling stress. This phenomenon was particularly evident at Rapid River (accession 90-194) in the October 1989 sample. One common cause of tetany in animals occurs when available calcium is not adequately ionized due to excessive phosphorus. Serum samples were collected in October from each of 50 test and normal fish, and resulting phosphorus levels were 21.2 and 14.2 mg/DL respectively. A follow-up serum sample in November had phosphorus levels reduced to 18.9 mg/DL in test fish with concurrent loss of tetany. Serum samples in January had dropped to 11.9 mg/DL.

Bacterial coldwater disease, caused by Flexibacter psychrophilus, did not produce obvious mortality. Fish examined with other conditions, ie, saprolegniasis, peduncle disease, etc., did not have the pathogen. In addition, the pathogen was not detected during pre-release inspections. Because the pathogen has been detected at some stations in the past, sampling techniques using tryptone yeast extract (TYE) will be used in the future with brain and spleen tissues to check for nonclinical infections.

Bacterial furunculosis, caused by Aeromonas salmonicida, was detected at Niagara Springs hatchery causing mortality in Pahsimeroi stock A steelhead during November 1989 and January 1990. The pathogen was resistant to Oxytetracycline. Treatments were effective using Romet 30. The mortalities were 2.75% (pond 6) and 0.29% (hatchery total) in November and 0.51% (ponds 1 & 6) and 0.09% (hatchery total) in January.

Enteric redmouth bacterium, caused by Yersinia ruckeri, was neither detected by culture nor were clinical signs seen during monthly visits.

#### PARASITIC PATHOGENS

Whirling disease spores (Myxobolus (Myxosoma) cerebralis),

were detected in 1988 Pahsimeroi summer chinook in June (91.7%) and March, 1990 (100%). Pahsimeroi adult summer chinook checked in September were negative. Adult A steelhead checked in March 1990 were positive (83.3%). Sawtooth hatchery had 16.7% of one ocean and 100% of two ocean A steelhead infected with M. cerebralis in April 1989. Adult chinook had infections of 25%. The 1988 spring chinook had 9% infections (reared on well water) and 25% infections (reared on river water at normal densities in June 1989). At release time, infections were 25% in a random sample. East Fork brood B steelhead had infections of 66.7% in one ocean and 0% in two ocean fish. The 1988 East Fork brood had infections of 0% in June 1989 and 75% in March 1990. Results on adult steelhead sampled in the spring of 1990 are incomplete at this writing.



Ceratomyxa Shasta, causative agent of ceratomyxosis, was detected in noninfectious spore stage in brood South Fork summer chinook at McCall (15.0%). Subsequent examinations of McCall juveniles were negative. The noninfectious spore state was also found in Rapid River adult spring chinook (85.0%), Clearwater spring chinook at Red River Pond (18.8%) and adult East Fork spring chinook at the East Fork satellite (42.3%). East Fork juveniles were negative. Sawtooth adult spring chinook had infections of 4.2%, and the 1988 brood juveniles were negative.

Proliferative kidney disease agent signs were not seen during inspections, therefore further sampling was unnecessary according to contract terms.

#### Other Fish Losses Attributed to Pathogens

In August, 1989, Red River ponds containing 1988 Clearwater spring chinook smolts suffered an epizootic caused by Ichthyophthirius multifiliis. Also clinically coinfecting **the** fish were Hexamita and Trichophrya (accession 89-143). The 10 day mortality was 27,092 of 300,000 fish or 9.0%. Treatments were ineffective due to pond design and poor flows. The mortality gradually reduced itself as maximum daily water temperatures reduced from 19 to **10°C**.

#### Laboratory Support Services Summary

During the year, laboratory support services were provided to anadromous facilities as follows:

virology.....	14	8
bacteriology.....	10	6
parasitology.....	11	7
water quality.....		8
hematology/clinical chemistry.....		10
histopathology .....		15
necropsies.....	117	
TOTAL		521

These are further summarized according to inspection work completed on adults and monitoring work on juveniles during monthly monitoring trips or periods of increased mortalities, respectively, in Tables 3 and 4.

## Hatchery Water Supply Studies

In compliance with objective 4.3 of the contract, pond flow and loading data have been provided quarterly to the technical contact, Ron Morinaka. These data are tabularized and included in this report (Table 5).

## Coordination Effort

In addition to the funding received through the BPA contract, the Eagle Fish Health Laboratory receives funding from Dingle Johnson (federal aid in sport fish restoration), the Lower Snake River Compensation Plan, and Department license fees. The BPA project, in addition to funding required contractual fish health services, has assisted some projects with funding listed above.

Partial description of the Eagle Fish Health lab's coordination activities, both with and without BPA funding or assistance, follows:

Coordination with the US Army Corps of Engineers for design and construction of a fish health laboratory located at Eagle, Idaho.

Coordination between Oregon State University (OSU) Department of Microbiology and Hagerman State Fish Hatchery for field testing a vaccine against IHN virus. Vaccine produced under BPA contract by OSU.

Coordination with USFWS (Seattle laboratory) concerning development of anti VHSV and anti IHNV antisera.

Coordination with USFWS Dworshak fish health lab concerning fish health concerns and activities in Idaho and inspection needs at Sawtooth hatchery.

Activity with the fish disease technical work groups under BPA with input for five year work plan development.

Coordination with hatchery and USFWS (Seattle laboratory) personnel involved with BKD prevalence study at Sawtooth hatchery.

Coordination with Alaska Fish and Game, Oregon Department of Fish and Wildlife (ODFW), USFWS, etc. concerning improving Eagle lab technique and equipment needs.

Examination of smolt released and recaptured downstream for diseases in cooperation with smolt monitoring passage work through Lower Granite reservoir.

- Inspection of Skanes Kamloop trout broodstock prior to importation into Idaho.
- Coordination of fish health needs with Idaho Power Company (IPC) at IPC funded mitigation hatcheries.
- Attendance of annual Rocky Plains fish health workshop and information interchange.
- Membership and attendance of Pacific Northwest Fish Health Protection Committee.
- Training of lab technicians at OSU Marine Science Center.
- Coordination in fish health inspection needs and joint interests with Utah Department of Natural Resources.
- Coordination of fish health research monies and research activity review. North Fork Clearwater River IHNV project. IHNV antiserum development work. University of Idaho and Idaho State University.

Coordination in white sturgeon fish health activities with the Department and University of California, Davis.

Assistance with Henrys Lake hybrid (Ennis rainbow trout X Henrys Lake cutthroat trout) sterility induction tests.

Coordination in Magic Valley and Hagerman State hatchery sanitation plans.

Coordination of diagnostic and inspection activities for all Idaho resident hatcheries and broodstock programs.

Coordination in fish health concerns associated with Department fish shipments.

Coordination of water quality tests at hatcheries as necessary (Oxbow water quality tests supporting steelhead and fall chinook mitigation programs.

- Coordination and planning with Department in future BKD segregation programs at anadromous and select resident stations.
- Inspection of private aquaculture farms.
- Assistance of local fishermen with fish health questions and problems.
- Assistance of Department, private sector, Department of Health and Welfare, etc. in state wild fish kills.

Coordination with private growers, tribes, USFWS, other state agencies, universities, etc. in fish imports and intrastate movements.

## Conclusions

The Idaho Department of Fish and Game's participation in this project has been very productive. Surveillance of juvenile fish at anadromous facilities has increased to 115 accessions in 1989 compared to 93 in 1988, and 68 in 1987. The same increases have been seen in broodstock inspections: in 25 accessions in 1989, 20 in 1988, 20 in 1987 and 5 in 1986. Benefits of this project include improvement of diagnostic capabilities to a parity with other agencies and enhancement of interagency coordination. Diagnostic laboratory services since 1986 have expanded to virology and histopathology, whereas prior to this time they encompassed only bacteriology and traditional parasitology and necropsy. Prior to 1986 virology and histopathology needs were done by other agencies or commercially. Sensitivity of laboratory techniques has also been a benefit which has been promoted through participation in this project.

## LITERATURE CITED

- Amos, Kevin H., editor. 1985. Procedures for the detection and identification of certain fish pathogens. 3rd ed., Fish Health Section, American Fisheries Society. Corvallis, OR.
- Foott, J. S. and A. K. Hauck. 1988. State of Idaho Augmented Anadromous Fish Health Monitoring. Annual Report 1987. U.S. Dept. of Energy. Bonneville Power Admin. 34 pp.
- Foott, J. S. and A. K. Hauck. 1989. Augmented Fish Health Monitoring. Annual Report 1988. U.S. Dept. of Energy. Bonneville Power Admin. 39pp.
- Goede, R. W. 1987. Utah Division of Wildlife Resources. Personal communication.
- Goede, R. W. 1988. Fish Health/Condition Assessment Procedures. Utah Division of Wildlife Resources. Logan, UT. 28 pp.

Table 2a

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-076	LOCATION: MV
SPECIES: STB	AUTOPSY DATE: 04/03/90
STRAIN: EF	AGE: BY89
UNIT:	SAMPLE SIZE: 20
REASON FOR AUTOPSY: PRE-RELEASE	
INVESTIGATOR(S): KH/RB/RL/SW	
REMARKS:	

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	<b>233.16</b>	<b>24.77</b>	<b>10.60</b>
WEIGHT	130.03	<b>43.77</b>	<b>33.43</b>
KTL*	0.99	0.06	5.86
CTL**	3.59	0.21	5.84
HEMATOCRIT	43.43	4.70	10.81
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	3.31	2.53	77.09

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

		PSEUDO-		MESEN.				HIND									
EYES	GILLS	BRANCHES		THYMUS	FAT	SPLEEN	GUT	KIDNEY	LIVER	BILE							
N 90	N 70	N	<b>70</b>	0	<b>200</b>	0 B	35	0	100	N 100	A	45	0	40			
B1	O F 25	<b>S</b>	<b>0</b>	1	50	1	0 R	65	1	<b>0 S</b>	0	B	30	1	50		
B2	O C 0	L	30	2	30	2	3 O G	0	2	O M	0	C	15	2	10		
E1	10 M 5	S&L	0		3	70	N0	0		G	0	<b>D</b>	03		0		
E2	O P 0	I	0		4	O	E	0		u	0	E	0				
H1	OOT 0	OT	0	$\bar{X}=$	1.10		OT	0	$\bar{X}=$	O.OOT	0	F	0				
H2	0	0	0			$\bar{X}=$	2.70					OT	0	$\bar{X}=0.70$			
M1	0																
M2	0																
OT	0																

## SUMMARY OF NORMALS

90	70	70	20	0	100	100	100	75	40
----	----	----	----	---	-----	-----	-----	----	----

SEX M: 0 F: 0 U: 0

## GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER: **1/20** SEVERE SPLEEN ATROPHY

Table 2b

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-077

SPECIES: ST

STRAIN: PAH

UNIT:

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KH/RB/RL/SW

REMARKS:

LOCATION: MV

AUTOPSY DATE: 04/03/90

AGE: BY89

SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	195.70	20.79	10.62
WEIGHT	75.70	22.57	29.82
KTL"	0.98	0.16	16.36
CTL**	3.54	0.58	16.38
HEMATOCRIT	41.53	10.25	24.69
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	3.94	1.47	37.41

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
"\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

		PSEUDO-		MESEN.				HIND					
EYES	GILLS	BRANCHES	THYMUS	FAT	SPLEEN	GUT	KIDNEY	LIVER	BILE				
N	60 N	25	N	40	0 5 5 0	0 B	35	0 100 N	100	A	10	0	35
B1	O F	55	S	0	1 3 0 1	5 R	55	1 O S	0	B	85	1	65
B2	O C	0	L	60	2 15 2	7 0 G	0	2 O M	0	C	52		0
E1	30 M	20	S&L	0	3	2 5 N 0	5		G	0	D	03	0
E2	10 P	0	I	0	4	O E	0		u	0	E		0
H1	OOT	0	OT	0	$\bar{X}= 0.60$	OT	0	$\bar{X}= 0.00$	OT	0	F		0
H2	0		0	0	$\bar{X}= 2.15$					OT	0	$\bar{X}=0.65$	
M1	0												
M2	0												
OT	0												

SUMMARY OF NORMALS

60 25 40 55 0 90 100 100 95 35

SEX M: 0 F: 0 U: 0

GENERAL REMARKS

FINS:

GONADS:ONE PRECOCIOUS MALE

SKIN:

OTHER: 1/20 HEMORRHAGE IN PYLORIC CAECA  
1/20 SPLENOMEGALY

Table 2c

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-078                      LOCATION: MV  
 SPECIES: STB                                AUTOPSY DATE: 04/03/90  
 STRAIN: CL                                  AGE: BY89  
 UNIT:                                        SAMPLE SIZE: 20  
 REASON FOR AUTOPSY: PRE-RELEASE  
 INVESTIGATOR(S): **KH/RB/RL/SW**  
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	217.75	17.87	8.21
WEIGHT	102.41	25.43	24.83
KTL*	0.98	0.05	4.90
CTL**	3.52	0.18	4.98
HEMATOCRIT	44.00	3.82	8.67
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	4.07	1.38	33.87

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

		PSEUDO-		MESEN.				HIND									
EYES	GILLS	BRANCHES	THYMUS	FAT	SPLEEN	GUT	KIDNEY	LIVER	BILE								
N	60 N 30	N 20	0 4 0 0	0 B	20	0 100	N 100	A 30	0 80								
B1	O F 30	S 0	1 45 1	5 R	80	1 100	O S 0	B 70	1 15								
B2	o c 15	L 80	2 15 2	60 G	0	2 100	O M 0	C 02	5								
E1	25 M 25	S&L 0	3 35 N	0	0		G 0	D 03	0								
E2	5 P 0	I 0	4 0 E	0	0		u 0	E 0									
H1	OOT 0	OT 0	$\bar{X} = 0.75$	OT 0	$\bar{X} = 0.00$	OOT 0	F 0										
H2	0	0 0	$\bar{X} = 2.30$					OT 0	x-o.20								
M1	0																
M2	0																
OT	0																

## SUMMARY OF NORMALS

60	30	20	40	0	100	100	100	100	80
----	----	----	----	---	-----	-----	-----	-----	----

SEX                      M: 0    F: 0    U: 0

## GENERAL REMARKS

FINS:    GONADS:

SKIN:    OTHER: **2/20** SPLEEN ATROPHY

Table 2d

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-030

SPECIES: SU

STRAIN: SF

UNIT: 1

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KH/RL/RL/SW

REMARKS:

LOCATION: MC

AUTOPSY DATE: 02/08/90

AGE: BY88

SAMPLE SIZE: 31

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	116.30	10.75	9.24
WEIGHT	18.38	5.13	27.90
KTL"	1.13	0.12	10.35
CTL**	4.09	0.42	10.30
HEMATOCRIT	40.90	4.39	11.15
LEUCOCRIT	0.67	0.24	3.58
SERUM PROTEIN	5.95	1.31	22.02

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
"CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES		MESEN.				HIND		KIDNEY		LIVER		BILE	
N	94	N	13	N	94	THYMUS	FAT	SPLEEN		GUT	100	N	94	A	0	0	52
B1	O	F	87	S	3	1	3	R	3	1	0	S	0	B	97	1	48
B2	O	C	0	L	0	2	0	2	87	G	6	2	O	M	6	C	0
E1	3	M	0	S&L	0		3	10	NO	0		G	0	D	0	3	0
E2	O	P	0	I	0		4	O	E	3		u	0	E	0		
H1	OOT	0	OT	0		X= 0.03		OT	6	X=	O.OOT	0	F	0			
H2	0		0	0			X= 2.06						OT	0		X=0.48	
M1	0																
M2	0																
OT	0																

SUMMARY OF NORMALS									
94	13	94	97	0	84	100	94	97	52

SEX M: 0 F: 0 U: 0

GENERAL REMARKS

FINS:

SKIN:

GONADS:

OTHER:



Table 2e

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-037

SPECIES: SU

STRAIN: SF

UNIT: 2

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KH/SL/RL/SW

REMARKS:

LOCATION: MC

AUTOPSY DATE: 02/08/90

AGE: BY88

SAMPLE SIZE: 29

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	112.83	27.34	24.25
WEIGHT	19.64	3.03	15.43
KTL*	1.13	0.05	3.98
CTL**	4.07	0.17	4.10
HEMATOCRIT	40.66	3.53	8.68
LEUCOCRIT	0.71	0.25	35.21
SERUM PROTEIN	7.70	1.02	13.25

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 90	N 0	N 93	0 6 9 0	O B	0 0 97	N 100	A 0 0 86		
B1 O F 1 0 0		S 7	1 2 8 1	7 R	661	3 S	0 B 93 1 14		
B2 OC 0		L 0	2 3 2	86 G	312	OM	0 C 02 0		
E1 7M 0		S&L 0	3	7 N 0	0	G	0 D 0 3 0		
E2 OP 0		I 0	4	O E	0	u	0 E 0		
H1 30T 0		OT 0	X- 0.34	OT	3 X- 0.00T	0	F 0		
H2 0		0 0	X- 2.00				OT 3 x-0.48		
M1 0									
M2 0									
OT 0									

SUMMARY OF NORMALS

90	0	93	69	0	66	97	100	93	0
SEX	M: 0	F: 0	U: 0						

GENERAL REMARKS

FINS: GENERALLY GOOD

SKIN: GENERALLY GOOD

GONADS:

OTHER: 3/60 SPLEEN ATROPHY,  
4/20 DISTENDED BLADDER:  
ONE EYE SUNKEN: 1/20 MINOR LIVER  
HEMORRHAGE

Table 2f

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-074

SPECIES: STA

STRAIN: PAH

UNIT: ALL PONDS

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KH/RL/SW

REMARKS:

LOCATION: NS

AUTOPSY DATE: 03/30/90

AGE: BY89

SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	222.48	29.32	13.18
WEIGHT	114.07	42.07	36.88
KTL"	0.98	0.11	11.46
CTL**	3.54	0.41	11.54
HEMATOCRIT	49.85	5.08	10.19
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	5.11	1.43	28.08

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	100	N	55	N	40	0	4 5 0	O	B	70	0	100	N	100	A	25	0	45	
B1		OF	40	S	0	1	3 5 1	5	R	1 5 1		O	S	0	B	60	1	45	
B2		OC	5	L	60	2	20 2	8 5	G	0 2		O	M	0	C	15	2	10	
E1		OM	0	S&L	0		3	10	NO	0			G	O	D	0	3	0	
E2		OP	0	I	0		4	O	E	0			U	O	E	0			
H1		OOT	0	OT	0	$\bar{X}= 0.75$			OT	0	$\bar{X}= 0.00$	OOT	0	F	0				
H2		0		0	0		$\bar{X}= 2.05$							OT	0	$\bar{X}=0.65$			
M1		0																	
M2		0																	
OT		0																	

SUMMARY OF NORMALS

100	55	40	45	0	85	100	100	85	45
SEX	M:	0	F:	0	U:	0			

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER:

Table 2g

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-075                      LOCATION: NS  
 SPECIES: STA                                AUTOPSY DATE: 03/30/90  
 STRAIN: HC                                  AGE: BY89  
 UNIT:                                        SAMPLE SIZE: 20  
 REASON FOR AUTOPSY: PRE-RELEASE  
 INVESTIGATOR(S): KH/RL/SW  
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	226.40	29.55	13.05
WEIGHT	119.49	45.54	38.11
KTL*	0.98	0.08	7.78
CTL**	3.54	0.37	10.46
HEMATOCRIT	43.90	17.03	3.88
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	4.46	1.22	27.27

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N 90	N 65	N 20	0 700	<b>O B</b>	65 0	100 N 100	A 80	0 75	
<b>B1</b>	OF 35	S 0	1 301	OR	2 5 1	O S 0	B 5	1 20	
B2	OC 0	L 80	2 02	80G	0 2	O M 0	C 15	2 0	
E1	5M 0	S&L 0	3	20N0	0	G O	D 0	3 5	
E2	5P 0	I 0	4	OE	0	U 0	E 0		
<b>H1</b>	OOT 0	OT 0	$\bar{X}=$ 0.30	OT	5	$\bar{X}=$ 0.00T	0	F 0	
H2	0	0	$\bar{X}=$ 1.20				OT 0	$\bar{X}=0.60$	
M1	0								
M2	0								
OT	0								

## SUMMARY OF NORMALS

90	65	20	70	0	90	100	100	85	75
----	----	----	----	---	----	-----	-----	----	----

SEX                      M:                      0                      F:                      0                      U:                      0

## GENERAL REMARKS

FINS:    GONADS:  
 SKIN:    OTHER: 3/20 LEUCOCRIT, 1/20 SPLEEN ATROPHY

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-057

SPECIES: SU

STRAIN: PAH

UNIT: POND 1

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KAJ/RL/SW

REMARKS:

LOCATION: PA

AUTOPSY DATE: 03/06/90

AGE: BY88

SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	136.95	11.21	8.21
WEIGHT	23.67	6.49	27.43
KTL"	0.91	0.10	10.46
CTL**	3.23	0.31	9.72
HEMATOCRIT	47.55	3.22	6.77
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	7.68	0.96	12.53

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
"CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	100	N	85	N	70	01	000		OB		00	ON	100	A	60	0	0		
B1	0	F	5	S	30	1	01		OR	551	OS	0	B	35	1	0			
B2	OC	0	L	0		2	02	15	G	02	OM	0	C	52	0				
E1	OM	5	S&L	0			3	70	N0	0		G	OD		030				
E2	OP	5	I	0			4	15	E	45		U	0	E	0				
H1	OOT	0	OT	0		$\bar{X}=$	0.00		OT	0	$\bar{X}=$	0.00	OT	0	F	0			
H2	0		0	0			$\bar{X}=$	3.00					OT	0	$\bar{X}=$	0.00			
M1	0																		
M2	0																		
OT	0																		

SUMMARY OF NORMALS

100	85	70	100	0	55	100	100	60	0
SEX	M:	0	F:	0	U:	0			

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER: 8/20 CRANIAL DEPRESSION

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-041A

SPECIES: SC

STRAIN: RR

UNIT: 2A

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KH/RB/RL/SW

REMARKS:

LOCATION: RR

AUTOPSY DATE: 02/16/90

AGE: BY88

SAMPLE SIZE: 15

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	120.05	9.37	7.80
WEIGHT	15.54	2.92	18.81
KTL*	0.86	0.04	4.14
CTL**	3.10	0.13	4.31
HEMATOCRIT	35.40	6.00	16.97
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.21	0.85	13.70

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
"CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	100	N	0	N	93	0	870	7B	0	0	100	N	100	A	0	0	33
B1	OF100	S	0	1	13	1	53	R	60	1	O	S	0	B	80	1	40
B2	OC	0	L	0	2	02	40	G	132	O	M	0	C	20	2	27	
E1	OM	0	S&L	0	3	0	NO	0		G	O	D	0	3	0		
E2	OP	0	I	0	4	0	E	27		U	OE		0				
H1	OOT	0	OT	0	$\bar{X}=0.13$	OT	0	$\bar{X}=0.00$	OOT	0	F	0					
H2	0	0	0	$\bar{X}=1.33$							OT	0	$\bar{X}=0.93$				
M1	0																
M2	0																
OT	0																

SUMMARY OF NORMALS

100      0      93      87      0      60      100      100      100      33

SEX      M:      0      F:      0      U:      0

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER: 1/20 LITHIC PSEUDOBRANCH

Table 2j

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-041B                      LOCATION: RR  
 SPECIES: SC                                      AUTOPSY DATE: 02/16/90  
 STRAIN: RR                                      AGE: BY88  
 UNIT: 2B                                        SAMPLE SIZE: 10  
 REASON FOR AUTOPSY: PRE-RELEASE  
 INVESTIGATOR(S): KH/RB/RL/SW  
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	118.80	10.18	8.57
WEIGHT	14.45	3.29	22.77
KTL*	0.83	0.04	5.34
CTL**	2.00	0.16	5.46
HEMATOCRIT	39.90	0.97	2.42
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.34	0.46	7.33

\*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

"CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	FAT	MESEN. SPLEEN	GUT	HIND KIDNEY	LIVER	BILE
N 100	N 0	N 100	0 100	0 2 0	B 0	0 100	N 100	A 0	O 60
B1 0	F 100	S 0	1 0 1	70	R 100	1 0	S 0	B 100	1 40
B2 0	C 0	L 0	2 0 2	10	G 0	2 0	M 0	C 0	2 0
E1 0	M 0	S&L 0	3	O NO	0	0	G 0	D 0	3 0
E2 0	P 0	I 0	4	O E	0	0	U 0	E 0	
H1 0	OOT 0	OT 0	$\bar{X}= 0.00$	OT 0	$\bar{X}= 0.00$	OOT 0	0	F 0	
H2 0		0 0		$\bar{X}= 0.90$				OT 0	$\bar{X}=0.40$
M1 0									
M2 0									
OT 0									

## SUMMARY OF NORMALS

100      0      100      100      0      100      100      100      100      100

SEX                      M: 0      F: 0      U: 0

## GENERAL REMARKS

FINS:    GONADS:

SKIN:    OTHER:

Table 2k

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-041C                      LOCATION: RR  
 SPECIES: SC                                    AUTOPSY DATE: 02/16/90  
 STRAIN: RR                                    AGE: BY88  
 UNIT: 2C                                      SAMPLE SIZE: 10  
 REASON FOR AUTOPSY: PRE-RELEASE  
 INVESTIGATOR(S): KH/RB/RL/SW  
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	123.10	7.64	5.20
WEIGHT	16.09	3.47	21.54
KTL"	0.86	0.05	5.60
CTL" "	3.07	0.19	6.10
HEMATOCRIT	40.80	2.73	6.69
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.47	0.53	8.15

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

"\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHES		MESEN.				HIND				LIVER		BILE			
N	100	N	0	N	100	0	70	0	10	B	90	0	100	N	100	A	0	0	50
B1	0	F	1	0	0	S	0	1	20	1	40	R	01	OS	0	B	100	1	50
B2	OC	0	L	0	2	10	2	50	G	02	OM	0	C	02	0				
E1	OM	0	S&L	0	3	0	NO	0	G	0	OD	030							
E2	OP	0	I	0	4	0	E	10	U	0	E	0							
H1	OOT	0	OT	0	$\bar{X}$ =	0.40	OT	0	$\bar{X}$ =	0.00	OT	0	F	0					
H2	0	0	0	0	$\bar{X}$ =	1.40					OT	0	$\bar{X}$ =	0.50					
M1	0																		
M2	0																		
OT	0																		

## SUMMARY OF NORMALS

100	0	100	70	0	90	100	100	100	100
-----	---	-----	----	---	----	-----	-----	-----	-----

SEX                      M: 0    F: 0    U: 0

## GENERAL REMARKS

FINS:    GONADS:

SKIN:    OTHER:

Table 21

SUMMARY OF FISH AUTOPSY																								
ACCESSION NO: 90-041D										LOCATION: RR														
SPECIES: SC										AUTOPSY DATE: 02/16/90														
STRAIN: RR										AGE: BY88														
UNIT: 2D										SAMPLE SIZE: 5														
REASON FOR AUTOPSY: PRE-RELEASE																								
INVESTIGATOR(S): KH/RB/RL/SW																								
REMARKS:																								
										STANDARD					COEFFICIENT									
MEAN										DEVIATION					OF VARIATION									
LENGTH										125.40					12.50					9.97				
WEIGHT										16.80					5.55					33.04				
KTL"										0.83					0.03					3.99				
CTL" "										3.00					0.13					4.45				
HEMATOCRIT										37.70					3.13					8.31				
LEUCOCRIT										0.00					0.00					0.00				
SERUM PROTEIN										6.06					0.66					10.86				
"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER																								
""CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER																								
-----																								
VALUES AS PERCENTS OF TOTAL SAMPLE																								
EYES		GILLS		PSEUDO-		MESEN.						HIND				LIVER		BILE						
				BRANCHES		THYMUS		FAT		SPLEEN		GUT		KIDNEY										
N	100	N	0	N	100	0	100	0	0	B	0	0	100	N	100	A	0	0	20					
B1	0	F	100	S	0	1	0	1	80	R	100	1	0	S	0	B	100	1	80					
B2	0	C	0	L	0	2	0	2	2	0	G	0	2	0	M	0	c	02	0					
E1	0	M	0	S&L	0			3	0	NO	0			G	0	D	03		0					
E2	0	P	0	I	0			4	0	E	0			U	0	E	0							
H1	OOT	0		OT	0	X̄=	0.00			OT	0	X̄=	0.00	OOT	0	F	0							
H2	0			0	0			X̄=	1.20							OT	0	X̄=	0.80					
M1	0																							
M2	0																							
OT	0																							
-----																								
SUMMARY OF NORMALS																								
100		0		100		100		0		100		100		100		100		20						
-----																								
SEX		M:		0		F:		0		U:		0												
=====																								
GENERAL REMARKS																								
FINS:										GONADS:														
SKIN:										OTHER:														



Table 2m

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-041E

SPECIES: SC

STRAIN: RR

UNIT: POND 1

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KH/RB/RL/SW

REMARKS:

LOCATION: RR

AUTOPSY DATE: 02/16/90

AGE: BY88

SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	117.95	7.54	6.39
WEIGHT	14.89	3.33	22.36
KTL*	<b>0.92</b>	<b>0.08</b>	<b>9.05</b>
CTL**	<b>3.32</b>	<b>0.30</b>	<b>9.04</b>
HET4ATOCRIT	<b>39.18</b>	4.31	11.00
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	<b>6.16</b>	<b>0.55</b>	<b>8.98</b>

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
" "CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES	GILLS	PSEUDO- BRANCHES	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N	95 N	0	N 100	0 100 0	5 B 0	0 100 N	100	A 0	0 <b>85</b>
B1	O F 95	S 0	1 0 1	<b>45</b>	R 80	1 <b>O S</b>	0	B 100	1 10
B2	O C 0	L 0	<b>2</b> 0 <b>2</b>	<b>50</b>	<b>G 15</b>	<b>2</b> O M	0	C <b>02</b>	0
E1	5 M 0	S&L 0		<b>3</b> <b>O NO</b>	0		<b>G</b> O	D 0	3 0
E2	O P 5	I 0		<b>4</b> O E	5		<b>U</b> 0	E 0	
H1	OOT 0	OT 0	$\bar{X}= 0.00$	OT 0	$\bar{X}= 0.00$	OOT 0	F 0		
H2	0	0 0		$\bar{X}= 1.45$			OT 0	$\bar{X}=0.20$	
M1	0								
M2	0								
OT	0								

SUMMARY OF NORMALS

**95** 0 100 100 0 **80** 100 100 100 **85**

SEX M: 0 F: 0 U: 0

GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER:

Table 2n

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 89-182                      LOCATION: ST  
 SPECIES: SC                                  AUTOPSY DATE: 09/19/89  
 STRAIN: ST                                  AGE: 10M0  
 UNIT: RCY 13/14                          SAMPLE SIZE: 20  
 REASON FOR AUTOPSY: PRE-RELEASE  
 INVESTIGATOR(S): SF  
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	114.90	24.28	21.00
WEIGHT	12.43	4.63	37.00
KTL"	0.82	0.00	0.00
CTL**	2.96	0.00	0.00
HEMATOCRIT	44.16	4.42	10.00
LEUCOCRIT	0.61	0.42	68.00
SERUM PROTEIN	0.00	0.00	0.00

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

"\*CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES		THYMUS		FAT		SPLEEN		GUT		KIDNEY		LIVER		BILE	
N	100	N	95	N	100	0	1000	0	B	0	0	95	N	100	A	0	0	65	
B1	OF	5	S	0	1	01	OR1001	5	S	0	0	0	B	90	1	35			
B2	OC	0	L	0	2	02	5	G	02	OM	0	C	10	2	0				
E1	OM	0	S&L	0		3	80	NO	0		G	OD		030					
E2	OP	0	I	0		4	15E	0		U	0	E	0						
H1	OOT	0	OT	0	$\bar{X}=$	0.00	OT	0	$\bar{X}=$	0.10	OT	0	F	0					
H2	0		0	0	$\bar{X}=$	3.10						OT	0	$\bar{X}=$	0.40				
M1	0																		
M2	0																		
OT	0																		

## SUMMARY OF NORMALS

100	95	100	100	0	100	95	100	90	0
-----	----	-----	-----	---	-----	----	-----	----	---

SEX                      M: 0                      F: 0                      U: 0

## GENERAL REMARKS

FINS:NO EROSION OBSERVED

GONADS:IMMATURE

SKIN:PARR MARKS - LITTLE SILVERING

OTHER: REFRACTOMETER NOT WORKING

Table 20

SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-055

SPECIES: SC

STRAIN: ST

UNIT: 4B

REASON FOR AUTOPSY: PRE-RELEASE

INVESTIGATOR(S): KAJ/RL/SW

REMARKS:

LOCATION: ST

AUTOPSY DATE: 03/05/90

AGE: BY88

SAMPLE SIZE: 20

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	130.70	8.88	6.79
WEIGHT	19.55	4.47	22.89
KTL*	<b>0.86</b>	<b>0.04</b>	<b>4.77</b>
CTL**	3.11	0.15	<b>4.77</b>
HEMATOCRIT	<b>44.05</b>	<b>3.68</b>	<b>8.35</b>
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	<b>5.97</b>	<b>1.30</b>	<b>21.85</b>

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER  
"CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES	THYMUS	MESEN. FAT		SPLEEN	HIND GUT	KIDNEY	LIVER	BILE	
N	<b>95</b>	N	<b>90</b>	N	<b>50</b>	0	1	0	0	0	<b>90</b>	N	<b>90</b>
B1	O	F	10	S	<b>50</b>	1		0	1	10	s	10	B
B2	O	C	0	L	0	<b>2</b>		<b>02</b>	<b>1</b>	5	G	0	C
E1	O	M	0	S&L	0			<b>3</b>	<b>7</b>	5	N	0	D
E2	O	P	0	I	0			<b>4</b>	<b>10</b>	E	0		E
H1	50T	0		OT	0	$\bar{X}=$	0.00		OT	0	$\bar{X}=$	0.10T	0
H2	0			0	0			$\bar{X}=$	<b>2.95</b>			OT	0
M1	0											x-o.00	
M2	0												
OT	0												

SUMMARY OF NORMALS

**95**    **90**    **50**    100    0    **90**    **90**    **90**    **35**    0

SEX            M:    0    F:    0    U:    0

GENERAL REMARKS

FINS:

SKIN:

GONADS:

OTHER:

## SUMMARY OF FISH AUTOPSY

ACCESSION NO: 90-056                      LOCATION: ST  
 SPECIES: SC                                  AUTOPSY DATE: 03/05/90  
 STRAIN: EF                                   AGE:  
 UNIT: 1B,2B,3B                              SAMPLE SIZE: 20  
 REASON FOR AUTOPSY: PRE-RELEASE  
 INVESTIGATOR(S): KAJ/RL/SW  
 REMARKS:

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	134.55	10.81	8.04
WEIGHT	21.44	5.63	26.26
KTL*	0.86	0.03	3.94
CTL**	3.11	0.12	3.95
HEMATOCRIT	49.89	6.29	12.60
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	6.23	2.09	33.59

"EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

\*"CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO THE FOURTH POWER

## VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO- BRANCHES		THYMUS		FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	100	N	95	N	85	01000		OB		00	95	N	100	A	45	0	0		
B1	OF	0		S	5	1	01	OR	751		5	S	0	B	35	1	0		
B2	OC	0		L	0	2	02	20G	02		OM	0	C	20	2	0			
E1	OM	0		S&L	0		3	65N0	0		G		OD			030			
E2	OP	5		I	0		4	15 E	25		U	0	E	0					
H1	OOT	0		OT	0	$\bar{X} = 0.00$		OT	0	$\bar{X} = 0.00$	OT	0	F	0					
H2	0			0	0			$\bar{X} = 2.95$					OT	0	$\bar{X} = 0.00$				
M1	0																		
M2	0																		
OT	0																		

## SUMMARY OF NORMALS

100	95	85	100	0	75	95	100	45	0
-----	----	----	-----	---	----	----	-----	----	---

SEX                      M: 0                      F: 0                      U: 0

## GENERAL REMARKS

FINS:

GONADS:

SKIN:

OTHER:

Table 3. Summary of augmented fish health inspections of adult salmon and steelhead at Idaho Columbia River tributary hatcheries.

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
East Fork Satellite	4/1989	89-58,65, 67,74	East Fork STB	O/60 VH 2/12 VP (5 fish pools) O/60 BK O/60 VE 4/12 PW (pools)
	8/1989	89-134,	East Fork SC	O/36 VH
	9/1989	137,149, 157,163, 169,185		O/36 VP O/25 VE 2/20 BK 11/26 PC
Oxbow	4/1989	89-56	Hells Canyon STA	O/60 VH O/60 vP O/60 VE O/60 BK O/20 PW (1 salt) 0/30 PW (2 salt)
	10/1989	89-206	Hells Canyon STA	Clinical MAS O/60 Pw O/60 PC
Comment: Prespawning mortality of 21% in 1989 versus 7% in 1988.				
Pahsimeroi	3/1989	89-50	Pahsimeroi STA	O/13 VE
	4/1989	89-124	Pahsimeroi STA	O/50 VE
	9/1989	89-166, 177, 184	Pahsimeroi su	O/28 VH O/28 VP O/60 VE 4/43 BK 0/2 PW 0/20 PC
	11/1989	89-211	Wild Pahsimeroi BT	O/1 PW
Comment: from headwaters supplying ponds.				

Table 3. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accessions</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Pahsimeroi (cont.)	3/1990	90-66	Pahsimeroi STA	O/65 VH O/65 VP O/64 BK O/20 BF O/20 BR 5/6 (pools) PW
Red River Pond	8/1989	89-140, 150	Clearwater SC	O/16 VH O/16 VP 6/20 BK 3/16 PC
Sawtooth	4/1989	89-60	Sawtooth STA	O/70 VH 1/70 VP O/61 VE O/60 BK 0/10 PC 1/6 pools PW (1 salt) 6/6 pools PW (2 salt)
	8/1989 9/1989	89-146, 162, 170	Sawtooth Sc	O/14 VH O/14 VP O/32 VE 10/60 BK 1/4 PW 1/24 PC
South Fork Satellite	8/1989 9/1989	89-145, 152, 168	South Fork su	1/15 VH 0/15 VP 0/61 VE 4/60 BK 0/12 PW 3/20 PC

Comment: VH detected after blindpassage.

(a) Stock Abbreviations  
 BT = brook trout  
 SC = spring chinook  
 STA = A steelhead  
 STB = B steelhead  
 su = summer chinook

(b) Pathogen Abbreviations

BC = bacterial Cytophaga

BF = bacterial furunculosis

BK = bacterial kidney disease

BR = enteric redmouth bacterium

PC ; Ceratomyxa Shasta (noninfectious stage) parasite

PW = Myxobolus (Myxosoma) cerebralis parasite

Ratio = no positive fish or pools/no. sampled

VE = EIBS virus

VH = IHN virus

VP I IPN virus

Table 4. Summary of diagnostics and health monitoring of juvenile salmon and steelhead at Idaho Columbia River tributary hatcheries.

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Magic Valley	2/10/1989	89-18	88 Pahsimeroi	O/2 BF
			STA	O/2 BR
Comment: Less than 10/day mortality. Epidermal hyperplasia. No parasites.				
	3/22/1989	89-42	Pahsimeroi	2/2 VH(pools)
			STA	0/10 VP
				0/11 BF
				0/11 BR
Comment: 0.07% mortality on two days.				
	4/6/1989	89-54	88 East Fork	O/60 VH
			STB	O/60 VP
				O/60 BK
	4/6/1989	89-55	88 Pahsimeroi	O/60 VH
			STA	O/60 VP
				O/60 BK
	8/8/1989	89-133	89 Clearwater	CWD
			STB	
Chloramine T reduced mortality (0.02%/day to 0.01%)				
	9/11/1989	89-174	89 Clearwater	O/59 VE
			STB	O/60 PW
	9/11/1989	89-175	89 East Fork	O/60 VE
			STB	O/60 PW
	9/11/1989	89-176	89 Pahsimeroi	O/60 VE
			STA	O/60 PW
10/17/1989	89-198	89 Clearwater	O/10 VH	
		STB	2/2 (pools)	VP
			O/10 VE	
			O/10 BK	
			o/5 PW	
Comment: clinical signs of virus present.				
	10/17/1989	89-199	89 East Fork	O/10 VH
			STB	o/10 VP
				O/10 VE
10/17/1989	89-200	89 Pahsimeroi	O/10 VH	
		STA	2/2 (pools)	VP
			O/10 VE	
Comment: No clinical virus signs present.				
	11/21/1989	89-215	89 Clearwater	O/10 VH
			STB	2/2 VP
				O/33 VE
				o/2 PC
Comment: VP non clinical				



Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Magic Valley (cont.)	11/21/1989	89-216	89 Pahsimeroi STA	O/10 VH 1/2 VP(pools) O/18 VE O/2 PC no parasites
Comment: Subclinical VP - no mortality.				
	11/21/1989	89-217	89 East Fork STB	O/10 VH o/10 VP O/20 VE no parasites
	12/14/1989	89-236	89 Clearwater STB	O/10 VH 2/2 VP(pools) O/21 BK no parasites
Comment: Moribund fish without VP signs. No mortality.				
	12/14/1989	89-237	89 Pahsimeroi STA	O/10 VH 2/2 VP(pools) O/24 BK no parasites
Comment: no mortality				
	12/14/1989	89-238	89 East Fork STB	O/10 VH 2/2 VP(pools) O/20 BK no parasites
Comment: First isolation of VP in this stock this year.				
	1/10/1990	90-9	89 East Fork STB	O/10 VH 2/2 VP(pools) no parasites
	1/10/1990	90-10	89 Pahsimeroi STA	O/10 VH 2/2 VP(pools) no parasites
Comment: Elevated lactate dehydrogenase.				
	1/10/1990	90-11	89 Clearwater STB	O/10 VH 2/2 VP(pools) no parasites
Comment: 1/2 VP pools positive via blindpassage.				
	2/23/1990	90-47	89 East Fork STB	O/10 VH 2/2 vP(pools) no parasites
	2/23/1990	90-48	89 Pahsimeroi STA	O/10 VH 2/2 VP(pools) no parasites

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>					
Magic Valley (cont.)	2/23/1990	90-49	89 Clearwater STB	0/10 VH					
				2/2 VP(pools)					
				0/5 BF					
				0/5 BR					
				0/5 BC					
	4/3/1990	90-76	89 East Fork STB	0/60 VH					
				5/12 VP(pools)					
				0/60 BK					
	4/3/1990	90-77	89 Pahsimeroi STA	0/60 VH					
				5/12 VP(pools)					
	4/3/1990	90-78	89 Clearwater STB	0/60 BK					
				0/60 VH					
11/12 VP(pools)									
				0/60 BK					
McCall	2/28/1989	89-24	88 South Fork su	0/60 VH					
				0/60 VP					
				28/60 BK					
				0/60 VE					
	Comment:	<u>Renibacterium</u>	<u>salmoninarum</u>	cells	too numerous to count.				
	6/27/1989	89-103	88 South Fork su	1/60 BK					
				0/60 PW					
	7/25/1989	89-123	88 South Fork su	0/10 PC					
				<u>Hexamita</u>					
	9/13/1989	89-178	88 South Fork su	0/60 VE					
				3/60 BK					
				0/10 PC					
	10/11/1989	89-193	88 South Fork su	0/16 VE					
				0/10 PC					
				no parasites					
	Comment:	pond	2	fish	with	minor	tetany	following	netting.
	11/24/1989	89-219	88 South Fork su	0/31 VE					
				0/31 BK					
	12/12/1989	89-233	88 South Fork su	0/23 VE					
				0/21 BK					
	1/19/1990	90-15	88 South Fork su	0/20 VH					
0/20 VP									
0/20 VE									
0/20 BK									
10/10									
Comment:	no	apparent	distress	from	<u>Trichophrya</u> .				

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
McCall (cont.)	1/19/1990	90-16	89 South Fork su (swimup fry)	O/20 VH
				O/20 VP
				O/10 BK
				no parasites
	2/8/1990	90-37	88 South Fork su	O/60 VH
				O/60 vP
				O/60 BK
				no parasites
	Comment: Gallimycin treatment apparently effective against BK.			
	4/10/1990	90-91	89 South Fork su	O/10 VH
O/10 VP				
no parasites				
Niagara Springs	2/10/1989	89-17	88 Pahsimeroi STA	O/5 VH
				O/5 VP
				O/5 VE
				O/6 BR
				O/6 BR
				<u>Micrococcus</u>
	Comment: Low mortality 40/10,000 was stress related.			
	4/5/1989	89-52	88 Pahsimeroi STA	O/60 VH
				O/60 VP
				O/60 BK
4/5/1989	89-53	Hells Canyon STA	no parasites	
			O/60 VH	
			O/60 vP	
8/8/1989	89-138	89 Pahsimeroi STA	O/60 BK	
			no parasites	
			no pathogens	
8/8/1989	89-139	89 Hells Canyon STA	no pathogens	
			no pathogens	
			no pathogens	
9/11/1989	89-172	89 Pahsimeroi STA	O/60 VE	
			O/60 PW	
			<u>Gyrodactylus</u>	
9/11/1989	89-173	89 Hells Canyon STA	(light)	
			O/58 VE	
			O/60 PW	
10/4/1989	89-195	89 Hells Canyon STA	no parasites	
			O/10 PC	
			no parasites	

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Niagara Springs (cont.)	11/20/1989	89-213	89 Pahsimeroi STA	O/43 VE O/10 VH o/10 VP 4/5 BF no parasites
Comment: furunculosis epizootic OTC-resistant <u>salmonicida</u> . Treatment with Romet 30				<u>Aeromonas</u> effective.
	11/20/1989	89-214	89 Hells Canyon STA	O/33 VE no parasites
	12/14/1989	89-234	89 Pahsimeroi STA	O/23 BK O/4 BF O/4 BR no parasites
	1211411989	89-235	89 Hells Canyon STA	O/20 BK O/3 BF O/3 BR no parasites
	1/10/1990	90-7	89 Hells Canyon STA	O/12 VH o/12 VP no parasites
	1/10/1990	90-8	89 Pahsimeroi STA	O/10 VH o/10 VP no parasites
	1/18/1990	90-18	89 Pahsimeroi STA	2/3 BF
Comment: furunculosis loss at 0.005%/day maximum. Isolate OTC-resistant, Romet sensitive. Romet treated 11/28. (Rwy 1,4,11,14).				
	1/26/1990	90-23	89 Pahsimeroi STA	4/5 BF
Comment: Furunuclosis loss at 0.008%/day maximum (rwy 6). Romet recommended.				
	1/26/1990	90-24	89 Hells Canyon STA	3/5 MAS
Comment: Rwy 11				
	212311990	90-45	89 Pahsimeroi STA	O/10 VH 2/2 VP(pools) O/5 BF O/5 BR 1/5 <u>Pseudomonas</u>
Comment: VP from blindpass. Recommended stringent hatchery sanitation to break VP cycle. First isolation of VP since 1987.				

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Niagara Springs	2/23/1990	90-46	89 Hells Canyon STA	O/10 VH o/10 VP
(cont.)	3/29/1990	90-74	89 Pahsimeroi STA	2/60 BK O/60 VH O/60 VP
Comment: first isolation of BK at this station.				
	3/29/1990	90-75	89 Hells Canyon STA	O/60 VH O/60 VP O/54 BK
Pahsimeroi	3/9/1989	89-35	87 South Fork su	O/60 VH O/60 VP 5/60 BK
	3/9/1989	89-36	87 Pahsimeroi su	O/60 VH O/60 vP 2/60 BK 6/6 PW (pools)
	6/29/1989	89-108	88 Pahsimeroi su	O/60 BK 11/12 (5 fish pools) PW
	7/27/1989	89-129	88 Pahsimeroi su	0/10 PC <u>Epistylus</u> (light)
	9/5/1989	89-165	88 Pahsimeroi su	O/60 VE 0/10 PC <u>Trichodina</u> <u>Hexamita</u>
Comment: parasites at light carrier level.				
	10/11/1989	89-197	88 Pahsimeroi su	0/10 PC 1/10 <u>Hexamita</u> 3/10 <u>Epistylus</u>
Comment: no treatment recommended.				
	11/18/1989	89-220	88 Pahsimeroi su	O/60 VE O/5 BF O/5 BR 1/5 CWD no parasites
CWD: subclinical				
	12/18/1989	89-245	88 Pahsimeroi su	O/10 BK <u>Dermocystidium</u> EGD 1/10
	1/31/1990	90-25	88 Pahsimeroi su	O/10 VH 0/10 VP EGD
Comment: PW signs				

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Pahsimeroi (cont.)	1/31/1990	90-28	89 Pahsimeroi su (raceway 1)	O/10 VH 0/10 VP 0/10 PW
Comment: minor coagulated yolk residual.				
	3/6/1990	90-57	88 Pahsimeroi su	O/60 VH O/60 vP O/20 VE O/60 BK O/10 BF O/10 BR 0/10 BC O/10 PC 12/12(pool) PW
Comment: PW intensity and prevalence are high. Some losses are reportedly occurring. Pond cleanup and water source evaluation recommended.				
	3/7/1990	90-58	89 Pahsimeroi su	BGD 4/4 no parasites
Comment: Benzalkonium chloride treatment recommended.				
Powell Satellite	7/17/1989	89-130	88 Clearwater STB	0/30 VE
Rapid River	2/24/1989	89-22	87 Rapid River SC	0/60 VH 0/60 VP 23/60 VE 16/60 BK 0/30 PW
	5/22/1989	89-83	87 Rapid River SC	7/60 VE
	5/22/1989	89-84	87 Rapid River SC	7/30 VE
	6/27/1989	89-102	88 Rapid River SC	O/60 VE O/60 BK O/30 PW
	7/24/1989	89-122	88 Rapid River SC	O/30 VE o/30 PW O/30 cs BGD
Comment: Chloramine T at 9 ppm.				
	8/29/1989	89-153	Rapid River SC	O/60 VH O/60 VP O/60 VE 18/60 BK 17/20 PC

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Rapid River (cont.)	8/29/1989	89-156	88 Rapid River SC	0/31 VE 0/10 PC <u>Epistylus</u> (light)
	9/14/1989	89-179	88 Rapid River SC	1/36 VE 0/10 PC 2/10 BK (clinical) 3/4 <u>Epistylus</u> <u>Saprolegnia</u>
	10/11/1989	89-194	88 Rapid River SC	0/5 VH 0/5 VP 11/42 VE (carrier) 12/12 BK 0/8 BF 0/8 BR 0/5 PW
	Comment: 10/12 BK carrier; 2/12 clinical. Tetany (extensive) following netting. Blood phosphorus levels high.			
	11/22/1989	89-218	88 Rapid River SC	0/60 VE 0/24 BK
	Comment: Blood phosphorus levels reduced. Tetany absent.			
	12/12/1989	89-232	88 Rapid River SC	18/60 VE 1/60 BK 0/3 PC EGD
	Comment: EGD pond 1 only.			
	12/12/1989	89-244	89 Rapid River SC lot #1	Coagulated yolk (minor). Developmental anomaly.
	1/19/1990	90-14	88 Rapid River SC (pond 1)	0/20 VH 0/20 VP 19/50 VE 0/50 BK 0/10 PC <u>Epistylis</u> 1/10 <u>EGD</u> 10/10 <u>Saprolegnia</u>
Comment: Gallimycin feedings apparently reducing BK level.				
	2/16/1990	90-41	88 Rapid River SC	0/60 VH 0/60 VP 4/43 VE 0/60 BK
	Comment: Pond 2 with VE positives.			

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Rapid River (cont.)	4/10/1990	90-90	89 Rapid River SC	0/10 VH 0/10 VP
Red River Pond	7/17/1989	89-127	88 Clearwater SC	0/22 VE 0/10 PC <u>Trichophrya</u> <u>Epistylus</u> <u>Hexamita</u> <u>I.multifilis</u>
Comment: no mortality, but potential exists.				
	8/16/1989	89-141	88 Clearwater SC	<u>Trichophrya</u> (heavy) <u>I.multifilis</u> (heavy)
Comment: Bioassay to control ICH loss using KMnO4 (lppm). Pond treated with no benefit.				
	8/19/1989	89-143	88 Clearwater SC	<u>Hexamita</u> 3/10 <u>I.multifilis</u> 10/10 <u>Trichophrya</u> 10/10
Comment: Weekly mortality 26,525/300,000 (8.8%). Pond treated with 80 ppm formalin in 3 hours. No observed benefit.				
	9/14/1989	89-180	88 Clearwater SC	<u>I.multifilis</u> 4/10 <u>Hexamita</u> 3/3
Comment: Gill hyperplasia. Decrease of water temperatures cause reduction in mortality.				
Sawtooth	3/8/1989	89-33	87 East Fork SC	0/60 VH 0/60 VP 0/21 VE 14/59 BK 6/6 (pools) PW
	3/8/1989	89-34	87 Sawtooth SC	0/60 VH 0/60 VP 32/60 BK 5/6 (pools) PW
	6/29/1989	89-106	88 East Fork SC	0/60 BK 0/60 PW



Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Sawtooth (cont.)	6/29/1989	89-107	88 Sawtooth SC	0/60 BK 0/60 PW
Comment: Well water incubated fish at low density were BKD negative; normal density river water incubated were BKD positive.				
	8/25/1989	89-154	88 East Fork SC	0/10 PC <u>Hexamita</u> <u>Epistylus</u> <u>I.multifilis</u>
Comment: Parasites at light carrier level.				
	8/25/1989	8-155	88 Sawtooth SC	0/10 PC <u>Hexamita</u> <u>I.multifilis</u>
Comment: Parasites at light carrier level.				
	9/19/1989	89-182	88 Sawtooth SC	0/60 VE 1/60 BK(heavy) <u>Hexamita</u> 5/10
Comment: 3% MgSO4 recommended.				
	10/10/1989	89-196	88 Sawtooth SC	0/10 PC 2/10 BGD no parasites
Comment: No treatment recommended.				
	11/9/1989	89-209	88 East Fork SC	0/40 VE <u>Epistylus</u> (light)
	11/9/1989	89-210	88 Sawtooth SC	0/40 VE 1/1 PW <u>Epistylus</u> 1/4 <u>Micrococcus</u> 1/4 <u>Saprolegnia</u>
Comment: PW fish with clinical lordoscoliosis.				
	12/19/1989	89-246	89 Sawtooth SC	0/10 VH 0/10 VP no pathogens
	12/19/1989	89-247	88 Sawtooth SC	1/11 BK(rwy 4) 0/10 BK(rwy 8) <u>Scyphidia</u> 9/21 <u>Trichophrya</u> 7/21 <u>Hexamita</u> 12/21
Comment: BK clinical signs in both raceways 4 & 8.				
	2/1/1990	90-26	88 Sawtooth SC	0/10 VH 0/10 VP 10/10 BK <u>Scyphidia</u>
Comment: Elevated mortality likely due to BKD.				

Table 4. (cont.)

<u>Facility</u>	<u>Date</u>	<u>Accession</u>	<u>Stock(a)</u>	<u>Results(b)</u>
Sawtooth (cont.)	2/1/1990	90-27	88 East Fork SC	0/10 VH 0/10 VP no parasites LLD
	2/1/1990	90-29	89 Sawtooth SC	0/10 VH 0/10 VP
Comment: minor coagulated yolk residual.				
	3/5/1990	90-55	88 Sawtooth SC	0/60 VH 0/60 VP 0/20 VE 6/61 BK 0/10 BF 0/10 BR 3/12(pools) PW 0/10 PC 0/10 BC
	3/5/1990	90-56	88 East Fork SC	0/60 VH 0/60 VP 0/20 VE 2/20 BK 0/10 BF 0/10 BR 0/10 BC 9/12(pools) PW 0/10 PC

- (a) Stock Abbreviations  
 SC = spring chinook  
 STA = A steelhead  
 STB = B steelhead  
 su = summer chinook

- (b) Pathogen Abbreviations  
 BC = bacterial Cytophaga  
 BF = bacterial furunculosis  
 BGD = bacterial gill disease  
 BK = bacterial kidney disease  
 BR = enteric redmouth bacterium  
 EGD = environmental gill disease  
 LLD = lipoid liver degeneration  
 PC = Ceratomyxa Shasta (noninfectious stage) parasite  
 PW = Myxobolus (Myxosoma) cerebralis parasite  
 Ratio = no positive fish or pools/no. sampled  
 VE = EIBS virus  
 VH = IHN virus  
 VP = IPN virus

TABLE 5a.

## MAGIC VALLEY HATCHERY

MO/YR	STOCK	NO.FISH	FISH/kg	AVG. TEMP(C)	FLO.IND.	DEN.IND	%MORT
MAR89	88PAHST	1933812	9.5	14.0	1.31	0.34	0.12
MAR89	88EFST	350420	9.4	14.0	1.02	0.27	0.10
APR89	88PAHST	1849300	9.5	14.0	1.31	0.36	0.12
APR89	88EFST	355300	9.9	14.0	1.03	0.29	0.08
NO FISH IN MAY OF 1989							
JUN89	89PAHST	1277460	1891.4	15.1	1.03	0.27	1.78
JUN89	89EFST	323266	2850.7	15.1	0.59	0.16	2.54
JUN89	89DWORST	985516	1255.2	15.1	1.18	0.31	3.85
JUL89	89PAHST	1256866	501.4	15.1	0.32	0.19	0.60
JUL89	89EFST	337999	662.4	15.1	0.33	0.21	0.98
JUL89	89DWORST	828774	427.2	15.1	0.35	0.20	0.64
AUG89	89PAHST	1253156	242.0	15.1	0.52	0.18	0.30
AUG89	89EFST	336811	240.2	15.1	0.63	0.22	0.35
AUG89	89DWORST	827156	215.5	15.1	0.67	0.23	0.32
SEP89	89PAHST	1250409	99.8	15.1	0.66	0.32	0.19
SEP89	89EFST	336161	124.8	15.1	0.68	0.34	0.19
SEP89	89DWORST	650245	104.0	15.1	0.60	0.29	0.32
OCT89	89PAHST	1246630	55.7	15.1	0.57	0.22	0.21
OCT89	89EFST	313982	55.5	15.1	0.38	0.22	0.22
OCT89	89DWORST	645708	55.4	15.1	0.77	0.20	0.42
<b>NOV89</b>	89PAHST	1199569	38.0	15.1	0.45	0.30	0.33
NOV89	89EFST	313339	40.4	15.1	0.29	0.27	0.26
NOV89	89DWORST	632380	42.3	15.1	0.44	0.29	0.33
DEC89	89PAHST	1198893	24.7	15.1	0.58	0.18	0.06
DEC89	89EFST	312634	24.4	15.1	0.55	0.17	0.22
DEC89	89DWORST	629861	26.7	15.1	0.58	0.18	0.40
JAN90	89PAHST	1198084	17.0	15.1	0.75	0.23	0.07
JAN90	89EFST	312226	18.7	15.1	0.66	0.20	0.13
JAN90	89DWORST	629247	18.5	15.1	0.74	0.23	0.10
FEB90	89PAHST	1197074	13.5	15.1	0.94	0.26	0.04
FEB90	89EFST	311936	12.0	15.1	0.95	0.27	0.05
FEB90	89DWORST	628422	12.4	15.1	1.04	0.29	0.08
MAR90	89PAHST	1197175	10.1	15.1	1.16	0.33	0.00
MAR90	89EFST	311946	10.3	15.1	1.07	0.30	0.00
MAR90	89DWORST	628193	10.7	15.1	1.18	0.33	0.00
APR90	89PAHST	1198000	9.2	15.1	1.22	0.34	0.01
APR90	89EFST	326600	9.4	15.1	1.18	0.33	0.01
APR90	89DWORST	597600	10.6	15.1	1.13	0.32	0.02

PAHST - Pahsimeroi A steelhead  
 EFST - East Fork B steelhead  
 DWORST - Dworshak B steelhead

TABLE 5b.

## McCALL HATCHERY

MO/YR	STOCK	NO. FISH	FISH/kg	AVG. TEMP(C)	FLO. IND.	DEN. IND	%MORT
JAN89	88SFSU	880928	2097.1	3.4	0.74	0.31	0.81
FEB89	88SFSU	1932415	1825.6	3.4	0.77	0.33	1.40
MAR89	88SFSU	1926790	1290.3	3.4	0.97	0.41	1.04
APR89	88SFSU	1905360	827.0	3.4	1.19	0.56	0.56
MAY89	<b>88SFSU</b>	1378662	518.1	6.2	0.05	0.27	0.31
JUN89	88SFSU	1376642	237.5	10.1	0.48	0.09	0.15
<b>JUL89</b>	<b>88SFSU</b>	1375840	117.2	11.2	0.78	0.14	0.06
AUG89	88SFSU	1084861	90.3	11.2	0.72	0.13	0.09
SEP89	88SFSU	1084271	72.3	11.2	0.84	0.15	0.05
OCT89	<b>88SFSU</b>	1084077	61.1	8.4	0.95	0.17	0.02
<b>NOV89</b>	<b>88SFSU</b>	1083992	54.9	7.3	1.01	0.18	0.01
DEC89	88SFSU	1083665	51.2	4.5	1.04	0.19	0.03
JAN90	88SFSU	1083469	49.9	3.4	1.05	0.19	0.02
FEB90	88SFSU	1083221	47.2	3.4	1.10	0.20	0.02
MAR90	88SFSU	1032513	45.5	3.4	1.02	0.18	0.10

SFSU - South Fork Salmon summer chinook

TABLE 5c.

## NIAGARA SPRINGS HATCHERY

MO/YR	STOCK	NO.FISH	FISH/kg	AVG. TEMP(C)	FLO.IND	DEN.IND.	%MORT
MAY89	89PAHST	1426896	5963.1	14.56	1.57	0.84	9.51
MAY89	89HCST	726623	3269.2	14.56	1.68	0.91	14.69
JUN89	89PAHST	1726806	1239.6	14.56	0.45	0.25	4.44
JUN89	89HCST	722279	774.1	14.56	0.47	0.18	0.60
JUL89	89PAHST	1717267	301.6	14.56	0.63	0.28	0.55
JUL89	89HCST	720506	214.7	14.56	0.67	0.28	0.25
AUG89	89PAHST	1816199	143.2	14.56	0.56	0.22	0.12
AUG89	89HCST	707865	102.6	14.56	0.43	0.20	0.06
SEP89	89PAHST	1212494	72.4	14.56	0.38	0.21	0.09
SEP89	89HCST	707066	53.8	14.56	0.48	0.31	0.11
OCT89	89PAHST	1210684	45.3	14.56	0.52	0.22	0.15
OCT89	89HCST	706349	34.5	14.56	0.65	0.28	0.10
NOV89	89PAHST	1205750	24.5	14.56	0.77	0.26	0.41
NOV89	89HCST	705753	21.1	14.56	0.90	0.31	0.08
DEC89	89PAHST	1204230	18.5	14.56	0.62	0.32	0.13
DEC89	89HCST	705071	16.4	14.56	0.71	0.36	0.10
JAN90	89PAHST	1203060	12.1	14.56	0.82	0.42	0.10
JAN90	89HCST	704543	11.3	14.56	0.91	0.47	0.07
FEB90	89PAHST	1202169	12.3	14.56	0.81	0.42	0.07
FEB90	89HCST	704089	10.8	14.56	0.94	0.48	0.06
MAR90	89PAHST	1196913	3.9	14.56	0.93	0.48	0.44
MAR90	89HCST	703356	3.1	14.56	1.05	0.54	0.10
APR90	89PAHST	956100	3.6	14.56	0.76	0.39	0.26
APR90	89HCST	947200	3.5	14.56	1.48	0.76	0.13

PAHST - Pahsimeroi A steelhead  
 HCST - Hells Canyon A steelhead

TABLE 5d.

## PAHSIMEROI HATCHERY

MO/YR	STOCK	NO.FISH	FISH/kg	AVG. TEMP(C)	FLO.IND	DEN.IND.	%MORT
MAR89	88PAHSU	1233648	1247.6	6.6	1.07	0.38	1.00
APR89	88PAHSU	1179210	645.2	9.4	1.61	0.57	4.41
MAY89	88PAHSU	1214588	367.0	11.8	0.80	0.03	7.90
JUN89	88PAHSU	1190418	209.8	13.9	1.00	0.04	1.99
<b>JUL89</b>	88PAHSU	1166728	133.7	15.3	1.22	0.05	1.99
AUG89	88PAHSU	1143510	82.0	14.4	1.53	0.07	1.99
SEP89	88PAHSU	1120755	61.4	12.2	1.75	0.08	1.99
OCT89	88PAHSU	1098452	46.7	9.2	1.85	0.09	1.99
<b>NOV89</b>	88PAHSU	1076592	46.3	6.2	1.74	0.09	1.99
DEC89	88PAHSU	1076493	45.9	4.1	1.40	0.09	0.49
JAN90	88PAHSU	1071217	45.4	4.3	1.38	0.09	0.50
FEB90	88PAHSU	1060545	41.9	4.1	1.64	0.09	0.50

PAHSU Pahsimeroi summer chinook

TABLE 5e.

## RAPID RIVER HATCHERY

MO/YR	STOCK	NO. FISH	FISH/kg	AVG. TEMP(C)	FLO.IND	DEN.IND.	%MORT
MAR89	88RRSC	5693599	1443.4	5.4	0.75	0.57	0.59
APR89	88RRSC	5677699	719.5	7.3	1.26	0.93	0.28
MAY89	88RRSC	5582363	428.8	7.3	1.79	0.92	0.21
JUN89	88RRSC	3384132	227.2	10.4	1.06	0.08	0.05
JUL89	88RRSC	3380782	181.4	14.1	1.14	0.08	0.10
AUG89	88RRSC	3377863	125.2	12.5	1.38	0.11	0.09
SEP89	88RRSC	3375673	81.0	9.3	1.63	0.15	0.06
OCT89	88RRSC	3365256	72.3	8.1	1.74	0.16	0.31
NOV89	88RRSC	3361866	69.8	5.3	1.76	0.16	0.10
DEC89	88RRSC	3360232	69.2	3.6	1.97	0.16	0.05
JAN90	88RRSC	3343482	68.4	3.8	1.95	0.16	0.50
<b>FEB90</b>	88RRSC	3331104	62.8	3.0	1.96	0.18	0.37
MAR90	88RRSC	3321600	58.2	5.3	1.92	0.18	0.26
APR90	89RRSC	4004056	994.0	7.3	0.99	0.43	0.34
MAY90	89RRSC	3996092	492.2	8.2	1.46	0.56	0.20

RRSC - Rapid River spring chinook

TABLE 5f.

## SAWTOOTH HATCHERY

MO/YR	STOCK	NO.FISH	FISH/kg	AVG. TEMP(C)	FLO.IND	DEN.IND.	%MORT
MAR89	<b>88SWTSC</b>	2691476	641.5	4.5	2.66	0.75	0.63
MAR89	88EFSC	612388	575.5	4.5	0.66	0.84	0.48
APR89	88SWTSC	2678051	401.2	6.2	0.96	0.19	0.49
APR89	88EFSC	610626	346.2	6.2	0.87	0.19	0.29
MAY89	88SWTSC	2270571	222.7	8.4	1.16	0.23	0.58
MAY89	88EFSC	609644	238.1	8.4	1.08	0.23	0.16
JUN89	88SWTSC	2180988	196.2	11.8	1.18	0.24	3.95
JUN89	88EFSC	609877	180.8	11.8	1.29	0.28	0.12
JUL89	88SWTSC	2120288	114.6	14.0	0.94	0.19	0.46
<b>JUL89</b>	88EFSC	519613	108.0	14.0	0.94	0.18	0.25
AUG89	88SWTSC	2119620	75.0	12.9	0.89	0.25	0.03
AUG89	88EFSC	519395	77.2	12.9	0.79	0.22	0.04
SEP89	88SWTSC	2118668	59.5	10.6	1.07	0.30	0.04
SEP89	88EFSC	519237	57.3	10.6	1.02	0.28	0.03
OCT89	88SWTSC	1720982	50.7	7.3	1.75	0.32	0.14
OCT89	88EFSC	518909	50.7	7.3	1.85	0.31	0.06
<b>NOV89</b>	<b>88SWTSC</b>	1719755	48.5	-17.9	1.83	0.34	0.13
<b>NOV89</b>	88EFSC	517652	48.5	3.9	1.92	0.32	0.06
DEC89	88SWTSC	1715693	48.4	2.2	2.61	0.34	0.24
DEC89	88EFSC	517104	48.5	2.2	2.31	0.32	0.11
JAN90	<b>88SWTSC</b>	1711125	48.5	1.7	2.60	0.34	0.27
JAN90	88EFSC	516519	48.5	1.7	2.30	0.32	0.11
FEB90	88SWTSC	1705763	48.5	1.7	2.59	0.34	0.31
<b>FEB90</b>	88EFSC	515747	48.5	1.7	2.30	0.32	0.15
MAR90	88SWTSC	1701037	50.1	2.2	2.50	0.32	0.28
MAR90	88EFSC	514597	49.2	2.2	2.26	0.31	0.22

SWTSC - Sawtooth spring chinook

EFSC - East Fork Salmon spring chinook



Appendix 1. Summary of project objectives and tasks.

Objective	1.0	Complete Start-up Phase
Task	1.1	Temporarily interrupted due to resignation of lead pathologist. Position was announced twice (nation-wide). Position filled in June, 1990.
Tasks	1.2	
	1.3	Ongoing
Objective	2.0	Serve on Technical Steering Committee
Task	2.1	Attend quarterly meetings: ongoing
Task	2.2	See Appendix 2; completed
Task	2.3	Facility impediment list: completed
Objective	3.0	Conduct augmented fish health monitoring
Task	3.1	Organosomatic analyses: ongoing
Task	3.2	Conduct field and lab work as per Table 2.1: ongoing
Objective	4.0	Conduct studies of hatchery water supplies
Task	4.1	Submit water sampling plan: completed
Task	4.2	Water sample collection plan: work awaiting BPA direction
Task	4.3	Record flow/density indices: ongoing
Objective	5.0	Record, analyze, report data
Task	5.1	Data forms summittal: completed
Task	5.2	Record data: ongoing
Task	5.3	Submit data quarterly: ongoing
Objective	6.0	Estimate benefits of project
Tasks	6.1.1	Gather, analyze and report data in table 2.3:
	6.1.5	ongoing; temporarily delayed due to resignation of lead pathologist.

## Appendix 2. Transfer of Technology (Task 2.2)

1. **Data** input and storage
  - a. From microcomputers at hatcheries to laboratory
  - b. Through microcomputer at laboratory
  - c. Through interaction with Department fisheries projects (tag recovery, etc.).
2. Data transfer and exchange
  - a. Disk and printout exchange
  - b. Electronic exchange of data via modem with hatcheries, other agencies, Bureau, etc.
  - c. Steering meeting attendance
  - d. Professional publication
  - e. Professional meeting attendance.